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| APPLICATION NO.  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/595,654   | 05/23/2007  | James E. McGrath     | 01640439AA          | 4178             |
| 30743 7590 08/06/2009<br>WHITHAM, CURTIS & CHRISTOFFERSON & COOK, P.C.<br>11491 SUNSET HILLS ROAD<br>SUITE 340<br>RESTON, VA 20190 |             |                      |                     |                  |
| EXAMINER<br>KARST, DAVID THOMAS  |             |                      |                     |                  |
| ART UNIT   |             | PAPER NUMBER         |                     |                  |
| 1796   |             |                      |                     |                  |
| MAIL DATE  |             | DELIVERY MODE        |                     |                  |
| 08/06/2009   |             | PAPER                |                     |                  |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/595,654

**Applicant(s)**

MCGRATH ET AL.

**Examiner**

DAVID KARST

**Art Unit**

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05/23/2007.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-29 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☒ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-29 is/are rejected.  
7) ☒ Claim(s) 2 and 19 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 02 May 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☒ Notice of Draftperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-850)  
4) ☐ Interview Summary (PTO-413)  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_  
Paper No(s)/Mail Date 05/02/2008

**DETAILED ACTION**

***Priority***

Applicant's claim for the benefit of a prior-filed application under 35 U.S.C. 119(e) or under 35 U.S.C. 120, 121, or 365(c) is acknowledged.

***Claim Objections***

Claim 2 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 recites "m + n is at least 4", which does not further limit the limitation in Claim 1 "m = 2 to 50, n = 2 to 30".

Claim 19 is objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only. See MPEP § 608.01(n). Accordingly, the claim has not been further treated on the merits.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 11-13 and 19 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 11 and 13 recite the limitation "the fluorinated block itself was made by a condensation reaction". It is not clear if this is a limitation of the method of making the fluorinated block or a limitation of the fluorinated block.

Claims 12 and 13 recite the limitation "the sulfonated block itself was made by a condensation reaction". It is not clear if this is a limitation of the method of making the sulfonated block or a limitation of the sulfonated block.

Claim 19 recites the limitation "the condensation reaction" in line 2. There is insufficient antecedent basis for this limitation in the claim because it is unclear to which condensation reaction this refers. There is a condensation reaction that makes the fluorinated block according to claim 13, a condensation reaction that makes the sulfonated block according to claim 13, and a condensation reaction that makes the multiblock copolymer according to claim 10.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 4-7, 9-16, 18, 22, and 23 are rejected under 35 U.S.C. 102(b) as being anticipated by McGrath et al (US PG Pub 2002/0091225 A1, hereafter McGrath).

Regarding Claim 4, McGrath teaches a proton exchange membrane (par. 0015) comprising a multiblock copolymer (par. 0015; 0040) that comprises one hydrophobic segment that is fluorinated and has no hydrophilic substituents (par. 0015, 0016) and one hydrophilic segment that is disulfonated (par. 0015), wherein the membrane has a mean humidity of about 35% (par. 0084, line 5), and has proton conductivity in a range of at least 0.005 S/cm (par. 0055, line 11). McGrath teaches that the proton exchange membrane comprises the multiblock copolymer (par. 0020), which reads on the claimed wherein the membrane has co-continuous morphology of hydrophobic and hydrophilic segments.

Regarding Claim 5, McGrath teaches the mean humidity is about 35% (par. 0084, line 5).

Regarding Claim 6, McGrath teaches the proton conductivity is in a range of at least 0.005 S/cm (par. 0055, line 11).

Regarding Claim 7, McGrath teaches the mean humidity is about 35% (par. 0084, line 5) and the proton conductivity is in a range of at least 0.005 S/cm (par. 0055, line 11).

Regarding Claim 9, McGrath teaches the hydrophilic segment is disulfonated (par. 0015).

Regarding Claim 10, McGrath teaches a method of making a multiblock copolymer (par. 0044) comprising a fluorinated hydrophobic segment that contains -C(CF<sub>3</sub>)<sub>2</sub>- (par. 0044, 0045) and a sulfonated hydrophilic segment that is disulfonated (par. 0044), comprising the step of: reacting at least one fluorinated block that contains

one  $-\text{C}(\text{CF}_3)_2-$  group and two  $-\text{OH}$  groups (par. 0044, 0045) with at least one sulfonated block that is disulfonated and contains two leaving groups (par. 0044, 0045) in a condensation reaction to form a multiblock copolymer (par. 0044, Scheme 1).

Regarding Claims 11-13, the limitations "the fluorinated block itself was made by a condensation reaction" and "the sulfonated block itself was made by a condensation" were interpreted as limitations of the fluorinated block and the sulfonated block and not limitations of the method of making them. Since Claims 11-13 are interpreted as products by the process of a condensation reaction, the product, which is the fluorinated block itself and the sulfonated block itself, has patentable weight, and the process of a condensation reaction does not have patentable weight. McGrath teaches the fluorinated block itself (par. 0044, 0045) and the sulfonated block itself (par. 0044, 0045). [E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) [See MPEP 2113].

Regarding Claims 14 and 15, McGrath teaches k fluorinated blocks, n sulfonated blocks, and m blocks of another block are reacted in the condensation reaction (par. 0044, Scheme 1; par. 0045), wherein  $n/n+m$  ranges from 0.001 to about 1 (par. 0016), and  $(n+m)/k$  is 1.01 (par. 0044, Scheme 1), which reads on more than one fluorinated block and more than one sulfonated blocks. McGrath also teaches the sulfonated block

can comprise combinations of the groups -S-, -SO-, -SO<sub>2</sub>-, -CO-, and -P(O)(C<sub>6</sub>H<sub>5</sub>)- (par. 0045, lines 1-3), which reads on more than one sulfonated block. McGrath also teaches that the reactants in the condensation reaction may comprise as the aromatic group, combinations of phenyl, naphthyl, and terphenyl groups (par. 0045, lines 12-15), which reads on more than one fluorinated block and more than one sulfonated block.

Regarding Claim 16, McGrath teaches the multiblock copolymer is used in proton exchange membranes for fuel cells (par. 0003) and that proton exchange membranes may be formed from the multiblock copolymer (par. 0054), which reads on forming a polymer electrolyte membrane. It is therefore inherent that a sufficient number of blocks are used in the condensation reaction to form a polymer electrolyte membrane.

Regarding Claim 18, McGrath teaches the sulfonated block is disulfonated (par. 0044).

Regarding Claim 22, McGrath teaches an ion-exchange resin (see ion exchange membranes, par. 0054) comprising a multiblock copolymer comprising at least one fluorinated hydrophobic segment that contains -C(CF<sub>3</sub>)<sub>2</sub>- (par. 0013, 0014) and at least one sulfonated hydrophilic segment that is disulfonated (par. 0013), wherein the multiblock copolymer has been formed by a condensation reaction (par. 0044, Scheme 1). Since Claim 22 recites a product by the process of a condensation reaction and since McGrath's multiblock copolymer meets the limitations of the claimed product, the product has patentable weight, and the process does not have patentable weight.

Regarding Claim 23, McGrath teaches the sulfonated hydrophilic segment is disulfonated (par. 0013).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath et al (US PG Pub 2002/0091225 A1, hereafter McGrath) and further in view of Fuller et al (US Patent No. 5,976,418, hereafter Fuller).

Regarding Claims 1-3, McGrath teaches a multiblock copolymer with chemical structure that reads on the disulfonated block, which is the block with the subscript m in the instant claim (see  $[-(\text{Ph}(\text{NaO}_3\text{S})-\text{Y}-\text{Ph}(\text{NaO}_3\text{S}))_n-(-\text{Ph}-\text{Y}-\text{Ph})_m-\text{O}-\text{Ph}-\text{Z}-\text{Ph}-\text{O}-)]_k$ , par. 0044, Scheme 1; see Y may include,  $-\text{SO}_2-$ , par. 0045; see Z may be a direct carbon-carbon single bond, par. 0045; see n/n+m ranges from about 0.001 to about 1, par.



0025; see  $(n+m)/k=1.01$ , par. 0044, Scheme 1). McGrath teaches  $M^+$  is a positively charged counterion selected from the group consisting of sodium (see  $SO_3Na$ , par. 0044, Scheme 1). Although McGrath's multiblock copolymer also has a block with a subscript  $m$  (par. 0044, Scheme 1), McGrath teaches  $n/n+m$  ranges from about 0.001 to about 1 (par. 0025) and  $(n+m)/k=1.01$  (par. 0044, Scheme 1), which means that it is possible for McGrath's subscript  $m$  to be zero, which means McGrath's multiblock copolymer reads on the multiblock copolymer as claimed and on the claimed  $m = 2$  to 50 in instant Claim 1 and on the claimed ranges of  $m + n$  in instant Claims 2 and 3. McGrath teaches the connection of respective blocks (see  $I$ , par. 0044, Scheme 1). McGrath teaches the multiblock copolymer may have a block that is fluorinated (see -Ph-Z-Ph-, par. 0044, Scheme 1; see Z may be,  $-C(CF_3)_2-$ , par. 0045).

McGrath does not teach the multiblock copolymer with chemical structure comprising the perfluorinated block, which is the block with the subscript  $n$  in the instant claim. However, Fuller teaches a polymer that reads on the perfluorinated block (col. 36, lines 5-15). Fuller teaches the number of repeating units of this block is 120 or greater than 1 (see  $n$  is about 120, col. 36, line 17; see  $n$  is  $>1$ , col. 9, line 32), which reads on the claimed  $n = 2$  to 30. McGrath and Fuller are analogous art because both references are in the same field of endeavor of fluorinated polymeric materials used in articles where electron flow or conductivity and resistance to oxidation is important. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Fuller's perfluorinated polymer to modify McGrath's multiblock copolymer comprising a disulfonated block, and would have been motivated to do so because Fuller teaches

that this polymer is useful for conductive polymeric coating compositions (col. 1, lines 5-6) and provides for the benefit of conductive polymers with high mechanical stability, high wear resistance (col. 5, lines 65-67), low surface energy (col. 6, lines 1-2), and resistance to oxidation (col. 6, lines 4-5), which are important for proton exchange membranes, ion-exchange resins, polymer electrolyte membranes, and fuel cells.

Claims 8, 17, 20, 24, 25, 28, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath as applied to claims 4, 10, 22, and 26 above, and further in view of Jacoby et al (WO Pub No. 03/030289, English Machine Translation used for citation purposes, hereafter Jacoby,).

Regarding Claim 8, McGrath teaches the hydrophobic segment is fluorinated (see -Ph-Z-Ph-, Z may be, -C(CF<sub>3</sub>)<sub>2</sub>-, par. 0015, 0016).

McGrath does not teach the hydrophobic segment is perfluorinated. However, Jacoby teaches a hydrophobic segment is perfluorinated (see perfluoro alkyl, claim 3), that this group is part of a block in a multiblock copolymer (see block segment B, claim 3; see multiblock copolymer, claim 1), and that a proton exchange membrane comprises the multiblock copolymer (see polymer gas cell membrane, claim 1; see fuel cells, polymer electrolyte membranes, p. 1 of English Translation). McGrath and Jacoby are analogous art because both references are in the same field of endeavor of making proton exchange membranes comprising multiblock copolymers that have fluorinated groups and sulfonated groups. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Jacoby's hydrophobic segment comprising

perfluorinated alkyl to modify McGrath's hydrophobic segment that is fluorinated, and would have been motivated to do so because Jacoby teaches that polymers that are fluorinated have significantly higher oxidation stability compared with non-fluorinated polymers (p. 2, line 14-15 from bottom of English Translation), which suggests that a polymer with more fluorine groups will have greater oxidation stability.

Regarding Claim 17, McGrath does not teach the fluorinated block is a perfluorinated block. However, Jacoby teaches the fluorinated block is a perfluorinated block (see perfluoro alkyl, claim 3), that this group is part of a block in a multiblock copolymer (see block segment B, claim 3; see multiblock copolymer, claim 1). McGrath and Jacoby are analogous art because both references are in the same field of endeavor of making proton exchange membranes comprising multiblock copolymers that have fluorinated groups and sulfonated groups. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Jacoby's perfluorinated block comprising perfluorinated alkyl to modify McGrath's fluorinated block, and would have been motivated to do so because Jacoby teaches that polymers that are fluorinated have significantly higher oxidation stability compared with non-fluorinated polymers (p. 2, line 14-15 from bottom), which suggests that a polymer with more fluorine groups will have greater oxidation stability.

Regarding Claim 20, McGrath teaches a multiblock copolymer comprising k fluorinated poly(arylene ether) segments (see -Ph-Z-Ph-, Z may be,  $-\text{C}(\text{CF}_3)_2-$ , par. 0044, 0045), at least two disulfonated poly(arylene ether sulfone) segments, and m segments of another segment (see  $-\text{Ph}(\text{SO}_3\text{H})-\text{Y}-\text{Ph}(\text{SO}_3\text{H})-$ , par. 0044; see Y may be, -

SO<sub>2</sub>-, par. 0045) is formed, wherein  $n/n+m$  ranges from 0.001 to about 1 (par. 0016), and  $(n+m)/k$  is 1.01 (par. 0044, Scheme 1), which reads on more than one fluorinated poly(arylene ether) segment and more than one disulfonated poly(arylene ether sulfone) segments. McGrath also teaches the disulfonated poly(arylene ether sulfone) segments can comprise combinations of the groups -S-, -SO-, -SO<sub>2</sub>-, -CO-, and -P(O)(C<sub>6</sub>H<sub>5</sub>)- (par. 0045, lines 1-3), which reads on more than one disulfonated poly(arylene ether sulfone) segment. McGrath also teaches that the reactants in the condensation reaction may comprise as the aromatic group, combinations of phenyl, naphthyl, and terphenyl groups (par. 0045, lines 12-15), which reads on more than one fluorinated poly(arylene ether) segment and more than one disulfonated poly(arylene ether sulfone) segment.

McGrath does not teach the poly(arylene ether) segment is perfluorinated. However, Jacoby teaches a segment that is perfluorinated (see perfluoro alkyl, claim 3), that this group is part of a block in a multiblock copolymer (see block segment B, claim 3; see multiblock copolymer, claim 1), and that a polymer electrolyte membrane comprises the multiblock copolymer (see polymer gas cell membrane, claim 1; see fuel cells, polymer electrolyte membranes, p. 1). McGrath and Jacoby are analogous art because both references are in the same field of endeavor of making polymer electrolyte membranes for fuel cells comprising multiblock copolymers that have fluorinated groups and sulfonated groups. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Jacoby's segment of a multiblock copolymer that is perfluorinated to modify McGrath's fluorinated poly(arylene ether) segment, and would have been motivated to do so because Jacoby teaches that

polymers that are fluorinated have significantly higher oxidation stability compared with non-fluorinated polymers (p. 2, line 14-15 from bottom), which suggests that a polymer with more fluorine groups will have greater oxidation stability.

Regarding Claims 24 and 28, McGrath teaches the fluorinated hydrophobic segment is a fluorinated ether (see -Ph-Z-Ph-, Z may be,  $-\text{C}(\text{CF}_3)_2-$ , par. 0015, 0016).

McGrath does not teach the fluorinated ether is perfluorinated. However, Jacoby teaches a hydrophobic segment is perfluorinated (see perfluoro alkyl, claim 3), that this group is part of a block in a multiblock copolymer (see block segment B, claim 3; see multiblock copolymer, claim 1), and that a proton exchange membrane comprises the multiblock copolymer (see polymer gas cell membrane, claim 1; see fuel cells, polymer electrolyte membranes, p. 1). McGrath and Jacoby are analogous art because both references are in the same field of endeavor of making proton exchange membranes for fuel cells comprising multiblock copolymers that have fluorinated groups and sulfonated groups. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Jacoby's hydrophobic segment that is perfluorinated to modify McGrath's hydrophobic segment that is a fluorinated ether, and would have been motivated to do so because Jacoby teaches that polymers that are fluorinated have significantly higher oxidation stability compared with non-fluorinated polymers (p. 2, line 14-15 from bottom), which suggests that a polymer with more fluorine groups will have greater oxidation stability.

Regarding Claims 25 and 29, McGrath teaches including fluorinated poly(arylene ether) (see -Ph-Z-Ph-, Z may be,  $-\text{C}(\text{CF}_3)_2-$ , par. 0013, 0014) and disulfonated

poly(arylene ether sulfone) segments (see  $-\text{Ph}(\text{SO}_3\text{H})-\text{Y}-\text{Ph}(\text{SO}_3\text{H})-$ , par. 0013; see Y may be,  $-\text{SO}_2-$ , par. 0013).

McGrath does not teach the fluorinated poly(arylene ether) segment is perfluorinated. However, Jacoby teaches a segment that is perfluorinated (see perfluoro alkyl, claim 3), that this group is part of a block in a multiblock copolymer (see block segment B, claim 3; see multiblock copolymer, claim 1), and that a polymer electrolyte membrane comprises the multiblock copolymer (see polymer gas cell membrane, claim 1; see fuel cells, polymer electrolyte membranes, p. 1). McGrath and Jacoby are analogous art because both references are in the same field of endeavor of making polymer electrolyte membranes for fuel cells comprising multiblock copolymers that have fluorinated groups and sulfonated groups. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Jacoby's segment of a multiblock copolymer that is perfluorinated to modify McGrath's fluorinated poly(arylene ether) segment, and would have been motivated to do so because Jacoby teaches that polymers that are fluorinated have significantly higher oxidation stability compared with non-fluorinated polymers (p. 2, line 14-15 from bottom), which suggests that a polymer with more fluorine groups will have greater oxidation stability.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath as applied to claim 10 above, and further in view of Percec (US Patent No. 4,638,039, hereafter Percec).

Regarding Claim 21, McGrath teaches a proton exchange membrane is constructed (par. 0003, 0054).

McGrath does not teach a step growth procedure. However, Persec teaches step growth polymerization for synthesis of polyethers (col. 1, lines 21-23). Percec also teaches making block copolymers comprising polyarylene polyether segments containing sulfur (col. 1, lines 47-63) and especially sulfonyl groups (col. 6, lines 24-30). McGrath and Persec are analogous art because both references are in the same field of endeavor of making block copolymers comprising poly(arylene ether sulfone) segments. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Persec's method of step growth polymerization of block copolymers comprising polyarylene polyether segments to modify McGrath's method of constructing a proton exchange membrane by making a multiblock copolymer of a fluorinated hydrophobic segment and a sulfonated hydrophilic segment, and would have been motivated to do so because Persec teaches that step growth polymerization provides for the benefit of a very fast reaction, nearly 100% yield, and quickly obtaining a high molecular weight polymer (col. 1, lines 21-26).

Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over McGrath et al (US PG Pub 2002/0091225 A1, hereafter McGrath) and further in view of Encyclopedia Britannica (Encyclopedia Britannica, 2009, "fuel cell", retrieved July 22, 2009 from Encyclopedia Britannica Online, <http://www.search.eb.com/eb/article-9106045>).

Regarding Claim 26, McGrath teaches a fuel cell comprising: a polymer electrolyte membrane (see proton exchange membrane, par. 0054) comprising a multiblock copolymer comprising: at least one fluorinated hydrophobic segment that contains  $-C(CF_3)_2-$  (par. 0013, 0014) and at least one sulfonated hydrophilic segment that is disulfonated (par. 0013), wherein the multiblock copolymer has been formed by a condensation reaction (par. 0044, Scheme 1). Since Claim 26 recites a product by the process of a condensation reaction and since McGrath's multiblock copolymer meets the limitations of the claimed product, the product has patentable weight, and the process does not have patentable weight. [E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) [See MPEP 2113].

McGrath does not teach an anode and a cathode. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use an anode and a cathode to modify McGrath's fuel cell comprising a polymer electrolyte membrane comprising a multiblock copolymer, and would have been motivated to do so because to be operable, a fuel cell must comprise an anode and a cathode as taught in Encyclopedia Britannica (p. 1).



Regarding Claim 27, McGrath teaches the sulfonated hydrophilic segment is disulfonated (par. 0013).

### Double Patenting

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The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claim 1 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claim 1 in view of claims 18 and 20 of U.S. Patent No. 7,361,729 B2 (hereafter, '729) in view of Fuller et al (US Patent No. 5,976,418, hereafter Fuller).

Claim 1 of '729 teaches a multiblock copolymer with a chemical structure that reads on the disulfonated block, which is the block with the subscript m in the instant

claim 1. Claim 1 of '729 teaches  $n/n+m$  can be 1, which reads on  $m$  of claim 1 of '729 being zero and on  $m=2$  to 50 in instant claim 1. Claim 1 of '729 does not teach the disulfonated block has a  $M^+$  for each sulfonate group. However, claims 18 and 20 of '729 teach an inorganic heteropoly acid that is phosphotungstic acid, which means the inorganic heteropoly acid has an  $M^+$ , and the inorganic heteropoly acid is part of a composition also comprising sulfonated polysulfone comprising at least one sulfonate at a location that reads on that of the sulfonate in claim 1 of '729, which suggests that the disulfonated block in claim 1 of '729 has a  $M^+$  at each sulfonate group. Claim 1 of '729 does not teach  $M^+$  is selected from the group consisting of potassium, sodium, and alkyl amine. However, claim 20 of '729 teaches  $M^+$  is tungsten. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use potassium or sodium to substitute for tungsten as the  $M^+$  in the multiblock copolymer of '729, and would have been motivated to do so because tungsten, potassium, and sodium can form positively charged counterions with a charge of  $1+$ , and one of ordinary skill in the art would have a reasonable expectation of success in obtaining a multiblock copolymer with the same ability to be used in proton exchange membranes, ion-exchange resins, polymer electrolyte membranes, and fuel cells.

Claim 1 of '729 does not teach the multiblock copolymer comprises a perfluorinated block as in the instant claim 1. However, Fuller teaches a polymer that reads on the perfluorinated block (col. 36, lines 5-15), and the number of repeating units of this block is greater than 1 (see  $n$  is  $>1$ , col. 9, line 32), which reads on  $n = 2$  to 30 in instant claim 1. McGrath and Fuller are analogous art because both references are in

the same field of endeavor of fluorinated polymeric materials used in articles where electron flow or conductivity and resistance to oxidation is important. At the time of the invention, a person of ordinary skill in the art would have found it obvious to use Fuller's perfluorinated polymer with greater than 1 repeating unit to modify the multiblock copolymer comprising a disulfonated block of the instant claim 1, and would have been motivated to do so because Fuller teaches that this polymer is useful for conductive polymeric coating compositions (col. 1, lines 5-6) and provides for the benefit of conductive polymers with high mechanical stability, high wear resistance (col. 5, lines 65-67), low surface energy (col. 6, lines 1-2), and resistance to oxidation (col. 6, lines 4-5), which are important for proton exchange membranes, ion-exchange resins, polymer electrolyte membranes, and fuel cells.

#### ***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID KARST whose telephone number is (571)270-7732. The examiner can normally be reached on Monday-Thursday, 7:30 AM-5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571)272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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